Robust, Low SWAP Planetary Entry, Descent and Landing System, Phase II

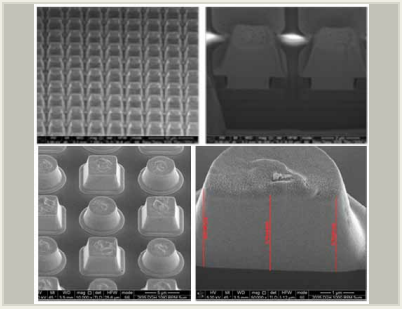
Completed Technology Project (2017 - 2021)

Project Introduction

A lander mission to Europa--Europa clipper mission--is planned to launch in the mid-2020s by NASA JPL. The mission presents multiple challenges, such as: ubiquitous presence of hazards at all scales, including craters, crevasses, boulders, etc.; ultra-high radiation environments due to proximity to Jupiter; and extremely limited lander resources for mass and volume and, hence, the amount of shielding that can be carried. Therefore, the critical phases of this mission require the ability to perform terrain-relative navigation (TRN) and surface-hazard detection in short time. To satisfy these requirements, a dual-functionality (altimetry and hazard mapping), large-format, monolithic, low-noise, highly sensitive, silicon single-photon avalanche photodiode (SPAD) lidar imager will be developed. The SPAD imager will be robust, radiation-hardened, and low in size, weight, and power, and it will provide altitude measurements to the ground beginning at an altitude of 8 km and all the way to touchdown (10 m altitude). At an altitude of 500 meters, it will provide a dense 3D terrain map covering a 100 m x 100 m landing area with 5 cm ground sample distance and range errors of less than 5 cm (3-sigma) in less than 1 second. The developed SPAD imager will be demonstrated in a benchtop lidar testbed.

Anticipated Benefits

The innovation satisfies the general need for a large-format, monolithic, highly sensitive detector focal plane array for 3D time-of-flight applications such as lidar autonomous navigation systems, docking and landing, space-based laser altimetry for studying the surface height of Earth and other planets from orbit, lidar instruments for atmospheric sciences, large-scale surveying / surveillance, bathymetry, and forestry.This innovation is also suited for emerging lidar systems being developed by commercial companies for guidance systems in autonomous vehicles. Other markets include forestry management and planning, urban planning, visualization and gaming, and most other 3D imaging applications.



Robust, Low SWAP Planetary Entry, Descent and Landing System, Phase II Briefing Chart Image

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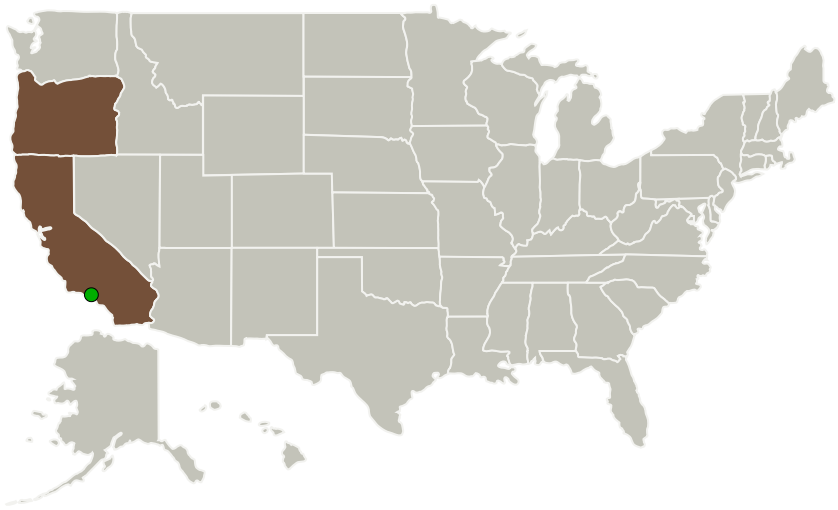
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Voxtel, Inc.	Lead Organization	Industry	Beaverton, Oregon
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Oregon

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Voxtel, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Managers:

Carol R Lewis
Lynn M Torres

Principal Investigator:

George Williams

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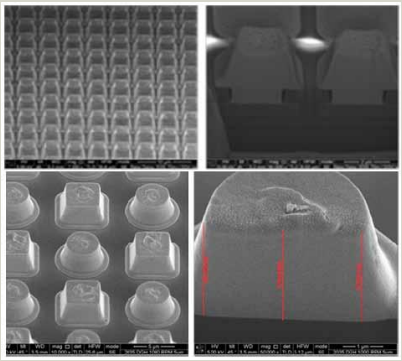
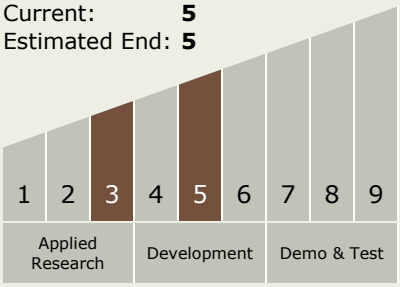
Images



Briefing Chart Image
Robust, Low SWAP Planetary Entry, Descent and Landing System, Phase II Briefing Chart Image *(https://techport.nasa.gov/image/126773)*

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System